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EXAMINER	
DHINGRA, RAKESH KUMAR	
ART UNIT	PAPER NUMBER
1792	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/519,724	LAERMER, FRANZ	
	Examiner	Art Unit	
	RAKESH K. DHINGRA	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *14-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *14-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 December 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claims 14-26 are currently pending and active.

Response to Arguments

Rejection of Claims 14 and 16 to 19 under 35 U.S.C. 103(a)

Applicant's arguments, filed 10/16/08 that state Loewenstein does not disclose the formation of chlorine trifluoride in the plasma reactor, and that the excited species are transferred to the wafer, has been fully considered and is persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Suto et al in view of Yanagisawa et al since the combination of references read on limitations of claim 14 as explained below. Therefore claims 14, 16-19, 20 and 22 have been rejected under 35 USC 103 (a) as explained below.

In response to applicant's argument that the office action does not provide a basis in fact or technical reasoning for the assertion of inherency in respect of claim 20, examiner responds that as explained under claim rejection, in the prior art method of Suto et al in view of Yanagisawa few molecules of various reactive species including ClF3 would be inherently produced besides FCl (as disclosed by the applicant). Further, since the claim does not recite any specific process conditions, except for use of a microwave plasma apparatus and use of two gases, which are also disclosed by the prior art apparatus and method of Suto et al in view of Yanagisawa, including use of same gases (viz. NF3 and Cl2), as also disclosed by the applicant, the prior art method would inherently produce chlorine trifluoride. Thus, the prior art method meets all the claim limitations, and the claim has been rejected as explained below. Balance claims 15, 21-25 have also been rejected as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 14, 16-20, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suto et al (NPL – Highly Selective Etching of Si3N4 to SiO2 Employing Fluorine and Chlorine Atoms Generated by Microwave Discharge – J. Electrochem. Soc., Vol. 136, No. 7, July 1989) in view of Yanagisawa et al (US PGPUB No. 2001/0007275).

Regarding Claims 14, 16: Suto et al teach a microwave plasma (high density plasma) etching apparatus (shown in Figure 1) for processing wafers comprising a plasma reactor (quartz tube) wherein a first gas (NF3) and a second gas (Cl2) are supplied to the plasma generating chamber (quartz tube) for carrying out etching on a silicon wafer. Suto et al further teach that etching is based upon the microwave plasma generated species of fluorine and chlorine that are supplied to a reaction chamber via a gas outlet. Suto et al also teach that interhalogen molecules (FCL) are also generated in the quartz tube. (e.g. Fig. 1 and pages 2032-2034). The apparatus is considered capable of generating chlorine trifluoride, since in such a reaction, few molecules of various reactive species including ClF3 would also be inherently produced besides FCl.

Further, the applicant has invoked 35 USC 112 sixth paragraph in respect of claim limitations a) "plasma generating means" as included in specification at page 11, lines 10-37

{including a microwave waveguide 150, magnetron 170, terminator 180, circulator 160, tuner 155) and b) gas supply means as included in specification at page 4, lines 25-30 {including gas bottles 21, 25 and mass flow regulators 22, 26).

Suto et al teach plasma generating means comprising of a microwave plasma apparatus but does not explicitly teach details of the same like waveguide, tuner, terminator etc, Further, Suto et al teaches supplying a first gas (NF3) and a second gas (Cl2) to plasma generating chamber, but does not explicitly teach gas supply means comprising gas bottles and mass flow regulators. However use of microwave plasma apparatus for plasma etching and comprising waveguide, tuner, terminator etc and gas bottles and mass flow regulators is known in the art as per reference cited hereunder.

Yanagisawa et al teach a plasma apparatus (Figure 1) comprising:

A discharge tube 2 (plasma reactor) with plasma generating means (including magnetron 10, waveguide 11 with tuner 14, isolator (normally includes circulator) 15 and reflection plate (terminator) 13, by which plasma can be generated in the discharge tube 2, gas supply means (including gas bombs 31, 32, 33 and gas flow controllers 34, 35, 36) via which a first and a second gas are supplied to the discharge tube 2 (plasma reactor), and reactive species generated due to reaction of two gases under high density plasma, are supplied to the process chamber via the gas pipe 20 at its outlet 20a (paragraphs 0044-0053).

Thus, the structure of the prior art apparatus of Suto et al in view of Yanagisawa et al as disclosed above is equivalent to the plasma generating means and the gas supply means as disclosed by the applicant. It would be obvious to provide the plasma generating means to include items like tuner, terminator, circulator etc and the gas supply means comprising items like gas bottles and mass flow controllers as taught by Yanagisawa et al in the apparatus of Suto

et al as known means for use in microwave plasma apparatus for generating plasma. Since the prior art apparatus of Suto et al in view of Yanagisawa et al meets all the structural limitations of the claim, and is equivalent to the applicant's disclosed apparatus the prior art apparatus is considered capable of generating chlorine tri-fluoride as claimed.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide plasma generating means comprising items like tuner, terminator, circulator etc and the gas supply means comprising items like gas bottles and mass flow controllers as taught by Yanagisawa et al in the apparatus of Suto et al as known means for use in microwave plasma apparatus for generating plasma.

In this connection courts have ruled:

An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

Also, claim limitations "device for generating chlorine trifluoride", "to form chlorine trifluoride" and "formed chlorine trifluoride" are intended use limitation, and since the prior art apparatus meets all the structural limitations of the claim, the same is considered capable of meeting the intended use limitation.

In this connection courts have ruled:

> A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Regarding Claim 17: Suto et al teach the plasma reactor includes a a quartz tube. Further, Yanagisawa et al teach the plasma reactor includes a tube 2 made from aluminum oxide (para. 0049).

Regarding Claim 18: Yanagisawa et al teach gas supply means with flow controllers 34, 35, 36 by which the quantities of first and second gases supplied are adjustable (para. 0050, 0063).

Regarding Claim 19: Suto et al in view of Yanagisawa et al teach all limitations of the claim (as already explained above under claim 14) including the apparatus having a process chamber with a wafer to be processed, and where the wafer is exposed to the plasma species generated by the device. Further, claim limitation "exposed to the gaseous chlorine trifluoride" is an intended use limitation, and since the prior art apparatus meets all the structural limitations of the claim, the same is considered capable of meeting the intended use limitation (relevant case law already cited above under claim 14).

Regarding Claims 20, 22: Suto et al in view of Yanagisawa et al teach all limitations of the claim (as explained above under claim 14) including a method wherein a first gas (NF3) and a second gas (Cl2) are supplied to a high density plasma reactor and wherein interhalogen FCl is produced in the plasma reactor. Further, though Suto et al in view of Yanagisawa et al do not explicitly teach that the method produces chlorine trifluoride, the prior art method would inherently produce chlorine trifluoride, since in such a reaction, few molecules of various reactive species including ClF3 would also be inherently produced besides FCl., especially since the claim does not recite any specific process conditions, except for use of a microwave plasma apparatus and use of two gases, which are also disclosed by the prior art apparatus and method of Suto et al in view of Yanagisawa, including same use of same gases (viz. NF3 and Cl2) as also disclosed by the applicant. Thus, the prior art method meets all the claim limitations.

Claims 15, 21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suto et al (NPL – Highly Selective Etching of Si3N4 to SiO2 Employing Fluorine and Chlorine Atoms Generated by Microwave Discharge – J. Electrochem. Soc., Vol. 136, No. 7, July 1989) in view of Yanagisawa et al (US PGPUB No. 2001/0007275) as applied to claims 14, 16-20, 22 and further in view of Ye et al (US 5,756,400).

Regarding Claims 15, 21: Su et al in view of Yanagisawa et al teach all limitations of the claim including a method using microwave plasma (high density plasma) apparatus but do not teach the plasma generating means comprise a coil, matching network and a high frequency generator.

Use of a RF coil for generating ahigh density plasma is known in the art for plasma processing as per reference cited hereunder.

Ye et al teach a method for dry-clean etching of chamber internal surfaces, wherein a first gas (fluorine containing gas) and a second gas (chlorine containing gas) are introduced in a high density inductively coupled plasma reactor comprising a coil 40, matching network 30 and a high frequency generator 28 (e.g. Fig. 2 and col. 7, line 10 to col. 8, line 5 and col. 11, line 62 to col. 15, line 15).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to use the plasma generating means including a coil, a matching network and a RF generator as taught by Ye et al in the apparatus and method of Su et al in view of Yanagisawa et al as a known means of generating high density plasma for semiconductor wafer processing.

In this connection courts have ruled:

An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

Regarding Claim 25: Ye et al teach that fluorine containing gas should be at least 50 % or greater and the chlorine containing gas should be minimum of 10 % to about 50%, which meets the claimed ratio of 3:1 (col. 11, lines 40-60).

Claims 23, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over of Suto et al (NPL – Highly Selective Etching of Si3N4 to SiO2 Employing Fluorine and Chlorine Atoms Generated by Microwave Discharge – J. Electrochem. Soc., Vol. 136, No. 7, July 1989) in view of Yanagisawa et al (US PGPUB No. 2001/0007275) as applied to claims 14, 16-20, 22 and further in view of Mori et al (US 6,136,214).

Regarding Claim 23: Suto et al view of Yanagisawa et al teach all limitations of the claim except oxygen being supplied as an additional gas to plasma reactor or to the process chamber.

Mori et al teach a method for etching silicon oxide film on semiconductor substrates using ClF3 as an etching gas and where oxygen was also supplied as an additional gas (col. 20, lines 5-18).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use oxygen as an additional gas supplied to the process chamber as taught by Mori et al in the apparatus of Suto et al in view of Yanagisawa et al for enhancing selective etching of silicon oxide films (column 20, lines 30-38).

Regarding Claim 26: Mori et al teach the plasma density used for etching is around 10.sup.11 -10.sup.12 particles/cm.sup.3 (col. 7, lines 20-30).

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suto et al (NPL – Highly Selective Etching of Si3N4 to SiO2 Employing Fluorine and Chlorine Atoms

Generated by Microwave Discharge – J. Electrochem. Soc., Vol. 136, No. 7, July 1989) in view of Yanagisawa et al (US PGPUB No. 2001/0007275) as applied to claims 14, 16-20, 22 and further in view of Ikeda et al (US 6,953,557).

Regarding Claim 24: Suto et al in view of Yanagisawa et al teach all limitations of the claim except a filter downstream from the plasma reactor for separating HF.

Ikeda et al teach a method where harmful gases like HF are removed from the etching gases like ClF3 using a removing apparatus (like a filter). Further, these removing apparatus (like stirring tank 5) are installed down stream of the plasma reactor (exhaust line 1) [col.1, lines 15-35 and col. 4, lines 10-60).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use filter for separating/treating gases like HF as taught by Ikeda et al in the apparatus of Suto et al in view of Yanagisawa et al to separate out harmful components from the etching gases like ClF3.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAKESH K. DHINGRA whose telephone number is (571)272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rakesh K Dhingra/
Examiner, Art Unit 1792

/K. M./
Primary Examiner, Art Unit 1792